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Case Report

Left brachiocephalic vein occlusion in a patient with an aortic arch aneurysm: Rare cause of obstraction for a pacemaker implantation

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ABSTRACT

Venous occlusions or anatomic variants are unexpectedly encountered during transvenous pacing lead implantation procedures. A 78-year-old man, who had been medically treated for a thoracic and abdominal dissecting aortic aneurysm was referred to our hospital for treatment of congestive heart failure due to complete atrioventricular block with bradycardia. At the time of the pacemaker implantation, the guidewire for inserting the introducer sheath could not be advanced into the left brachiocephalic vein. A venogram and contrast-enhanced chest multi-detector computed tomography revealed an obstruction of the left brachiocephalic vein at the confluence of the left internal jugular and left subclavian veins, and there was collateral blood circulation. We abandoned introducing the pacemaker lead from the left side, and implanted the pacemaker in his right anterior chest. In this case, the left brachiocephalic vein was occluded due to dilatation and elongation of the aortic arch aneurysm and the deviated left common carotid artery. This case illustrates the importance of the assessment of the patency of the left brachiocephalic vein prior to the central venous approach from the left internal jugular and left subclavian veins in patients with aortic arch aneurysms.

<**Learning objective:** Venous occlusions or anatomic variants are unexpectedly encountered during transvenous pacing lead implantation procedures. Dilatation and elongation of the aortic arch aneurysm and the deviated left common carotid artery can be a cause of a left brachiocephalic vein occlusion. It is important to assess the patency of the left brachiocephalic vein prior to the central venous approach from the left internal jugular and left subclavian veins in patients with aortic arch aneurysms.>

Introduction

Venous occlusions or anatomic variants are unexpectedly encountered during transvenous pacing lead implantation procedures [1,2]. Here we describe a case with a left brachiocephalic vein occlusion due to dilatation and elongation of an aortic arch aneurysm, which is a rare cause of a venous obstruction.

Case report

A 78-year-old man, who had been medically treated for a thoracic and abdominal dissecting aortic aneurysm as an inpatient two years previously and who had refused surgical treatment, was referred to our hospital for general fatigue and dyspnea on effort, which had lasted for 2 days. At the time of admission, his 12-lead electrocardiogram revealed complete atrioventricular block with bradycardia, and the chest X-ray revealed cardiomegaly and slight pulmonary edema. Because we diagnosed his clinical condition as acute heart failure due to complete atrioventricular block with bradycardia, we made an attempt to implant a dual-chamber pacemaker in his left anterior chest. The guidewire for inserting the introducer sheath was introduced into the venous system via a left cephalic vein cut-down technique. However, the guidewire could not be advanced into the left brachiocephalic vein. A venogram revealed an obstruction of the left brachiocephalic vein at the confluence of the left internal jugular and left subclavian veins, and there was collateral blood circulation (Fig. 1A). Therefore, we abandoned introducing the pacemaker lead from the left side, and implanted the pacemaker in his right anterior chest. After that, his congestive heart failure improved, and he was discharged home without any symptoms.

The day before the pacemaker implantation, contrast-enhanced chest multi-detector computed tomography (MDCT) was performed because he complained of atypical chest pain. The MDCT

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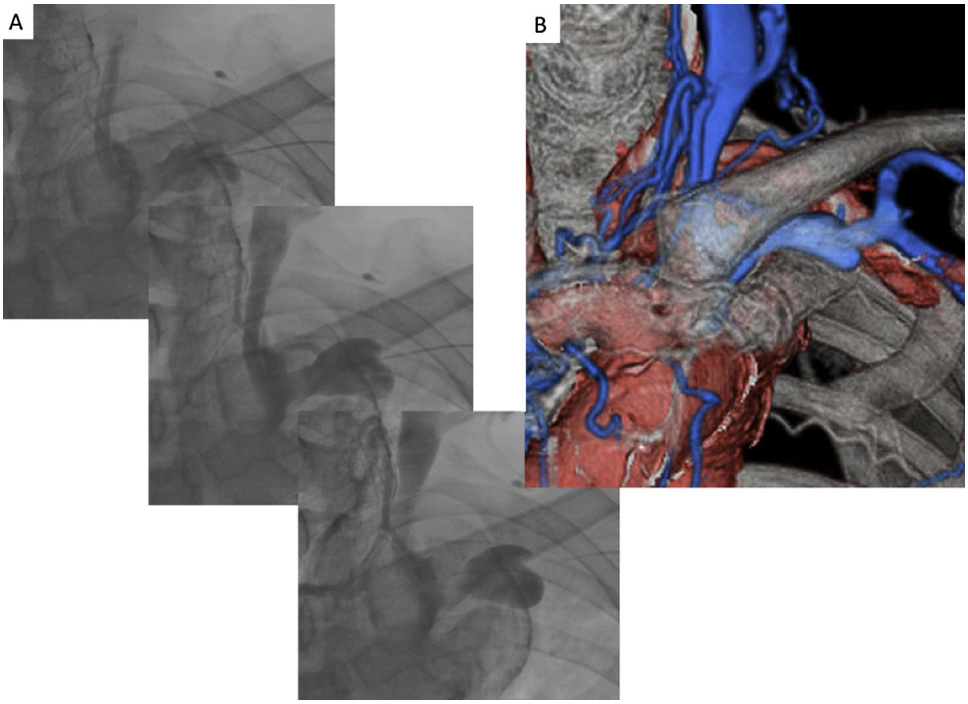

Fig. 1. (A) Intra-procedural venography showing no left brachiocephalic vein and the development of collateral veins. (B) Three-dimensional reconstruction of the computed tomography of the chest showing a disruption of the beginning of the left brachiocephalic vein and the development of collateral veins as shown by venography.

images showed no progression of the aortic dissection or aortic aneurysm. A careful review of the MDCT images after the pacemaker implantation procedure revealed that the left brachiocephalic vein obstruction was caused by compression between the left common carotid artery, which deviated forward due to dilatation and elongation of the aortic arch aneurysm, and an extremitas sternalis claviculae (Figs. 1B and 2).

Discussion

We experienced a case with left brachiocephalic vein occlusion due to dilatation and elongation of the aortic arch aneurysm and the deviated left common carotid artery, which is not well known.

Asymptomatic venous abnormalities are not rare among candidates for transvenous pacing or ICD lead implantations [1,2]. Venous abnormalities are important in clinical practice because they may complicate the lead placement and, occasionally, force the choice for an alternate transvenous approach with a prolonged procedure time. Oginosawa et al. [1] reported the prevalence of pre-procedural venous anatomic variants and occlusions among patients undergoing implantations of transvenous leads. Among their patients, complete venous occlusions associated with the development of collateral circulation were observed in12 of 273 patients (4.4%); at the site of the left innominate vein in 9, left subclavian vein in 2, and right subclavian vein in 1 patient. Of those 12 patients with venous occlusions, 7 had a history of a previous surgical procedure. The 12 patients in the occlusion group revealed a significantly greater cardio-thoracic ratio on the chest X-ray than the 260 patients in the no occlusion group. Korkeila et al. [2] reported that 10 of 136 patients (7.4%) were found to

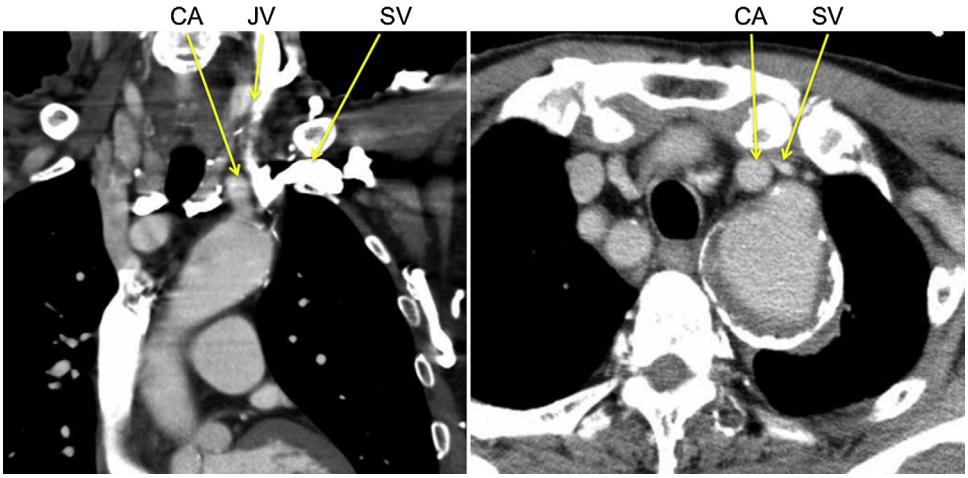

Fig. 2. Frontal (left panel) and axial (right panel) chest multi-detector computed tomography images showing the left brachiocephalic vein obstruction caused by compression between the left common carotid artery which deviated forward due to dilatation and elongation of the aortic arch aneurysm and an extremitas sternalis claviculae. SV, left subclavian vein; JV, left jugular vein; CA, left common carotid artery.

have pre-procedural venous anomalies, but that included only 1 patient with a complete occlusion at the site of left subclavian vein. In our case, the left brachiocephalic vein obstruction was caused by compression between the left common carotid artery, which deviated forward due to dilatation and elongation of the aortic arch aneurysm, and an extremitas sternalis claviculae. Most patients with a venous occlusion are asymptomatic because of the development of a collateral venous network [3,4]. Thus, a venous occlusion usually does not manifest on a physical examination before the implantation of transvenous pacing leads. Most often reported causes of an upper extremity venous occlusion are blood stasis at the site of a valve or venous angulation, prior placement of a central venous catheter, malignancy, irradiation, renal failure, hemodialysis, and infection [5–7].

This case illustrates the importance of the assessment of the patency of the left brachiocephalic vein prior to the central venous approach from the left internal jugular and left subclavian veins in patients with aortic arch aneurysms.

Conflict of interest

Authors declare no conflict of interest.

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